

CLAIMS

1 (Currently Amended). A digital equalization method for estimating discrete information symbols from digital samples of a signal received over a transmission channel represented by a finite impulse response of $W+1$ coefficients, W being an integer greater than 1, comprising the steps of:

- determining W roots in the complex plane of the Z-transform of the impulse response;
- distributing the W roots into a first set of $W-p$ roots and a second set of p roots, p being an integer greater than 0 and smaller than W , the roots of the second set being closer to the a unit circle of the complex plane than those of the first set according to a determined distance criterion in the complex plane;
- obtaining an intermediate signal by applying a first equalization method to the received signal based on a finite impulse response having a Z-transform consisting of a polynomial of degree $W-p$ in Z^{-1} , having roots equal to the $W-p$ roots of the first set; and
- obtaining estimations of the discrete information symbols by applying a second equalization method to the intermediate signal based on a finite impulse response having a Z-transform consisting of a polynomial of degree p in Z^{-1} , having roots equal to the p roots of the second set.

2 (Currently Amended). A method according to claim 1, wherein the first equalization method yields the intermediate signal in the form of a vector Y' of $n+p$ samples obtained according to the relation :

$$Y' = (A'^H A')^{-1} A'^H Y$$

where n is an integer representing a ~~frame-size~~ number of the discrete information symbols, Y is a vector composed of $n+W$ samples of the received signal, and A' is a matrix with $n+W$ rows and $n+p$ columns having a Toeplitz structure formed from the coefficients of said polynomial of degree $W-p$ in Z^{-1} .

3 (Previously Presented). A method according to claim 1, wherein the second equalization method comprises implementing a Viterbi algorithm.

4 (Previously Presented). A method according to claim 1, wherein the unit circle distance criterion, used to distribute the W roots $\alpha_1, \dots, \alpha_W$ of the Z-transform of the channel impulse response into the first and second sets, is expressed as a distance δ_q of the form $\delta_q = 1 - |\alpha_q|$ if $|\alpha_q| \leq 1$, and of the form $\delta_q = 1 - 1/|\alpha_q|$ if $|\alpha_q| > 1$, for $1 \leq q \leq W$.

5 (Currently Amended). A radio communications receiver comprising:

- conversion means to produce digital samples from a radio signal received over a transmission channel represented by a finite impulse response of $W+1$ coefficients, W being an integer greater than 1;
- means for measuring the channel impulse response;
- means for calculating W roots in the complex plane of the Z-transform of the impulse response;
- means for distributing the W roots into a first set of $W-p$ roots and a second set of p roots, p being an integer greater than 0 and smaller than W , the roots of the second set being closer to the a unit circle of the complex plane than those of the first set according to a determined distance criterion in the complex plane;
- a first equalization stage for producing an intermediate signal by applying a first equalization method to the received signal based on a finite impulse response having a Z-transform consisting of a polynomial of degree $W-p$ in Z^{-1} , having roots equal to the $W-p$ roots of the first set; and
- a second equalization stage for producing estimations of the discrete symbols of a signal carried on the channel by applying a second equalization method to the intermediate signal based on a finite impulse response having a Z-transform consisting of a polynomial of degree p in Z^{-1} , having roots equal to the p roots of the second set.

6 (Currently Amended). A receiver according to claim 5, wherein the first equalization stage is arranged to yield the intermediate signal in the form of a vector Y' of $n+p$ samples obtained according to the relation:

$$Y' = (A'^H A')^{-1} A'^H Y$$

where n is an integer representing a ~~frame-size~~ number of the discrete symbols, Y is a vector composed of $n+W$ samples of the received signal, and A' is a matrix with $n+W$ rows and $n+p$ columns having a Toeplitz structure formed from the coefficients of said polynomial of degree $W-p$ in Z^{-1} .

7 (Previously Presented). A receiver according to claim 5, wherein the second equalization stage is arranged to implement a Viterbi algorithm.

8 (Previously Presented). A receiver according to claim 5, wherein the means for distributing the W roots into the first and second sets make use of a unit circle distance criterion expressed as a distance δ_q of the form $\delta_q = 1 - |\alpha_q|$ if $|\alpha_q| \leq 1$, and of the form $\delta_q = 1 - 1/|\alpha_q|$ if $|\alpha_q| > 1$, for $1 \leq q \leq W$.